SOILS AND FOUNDATION INVESTIGATIONS FOR
APPROPRIATED FUND QUARTERS
AT
U. S. NAVAL STATION, TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

A & E CONTRACT No. NBy-61078

MKE No. 2498
11 January 1965

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YERBA BUENA ISLAND

McCREARY · KORETSKY · ENGINEERS

MKE

1140 Howard Street, San Francisco 3, California, HEmlock 1-4888

MKE No. 2498

11 January 1965

SOILS AND FOUNDATION INVESTIGATIONS FOR APPROPRIATED FUND QUARTERS AT U. S. NAVAL STATION, TREASURE ISLAND SAN FRANCISCO, CALIFORNIA A & E CONTRACT No. NBy-61078

INTRODUCTION

This report describes soils and foundation investigations made at proposed sites for appropriated fund quarters at the U. S. Naval Station, Treasure Island, San Francisco, California. The work was accomplished in accordance with terms of Contract No. NBy-61078 between the Twelfth Naval District and the Joint Venture of McCreary · Koretsky . Engineers - Abrams - Keller and Gannon.

The project comprises two separate construction sites: one in the northwest part of the nearly level Treasure Island, and the other on the steep slopes of the adjoining Yerba Buena Island. Owing to their fundamentally differing geology and foundation engineering problems, the two sites are treated independently in this report.

TREASURE ISLAND

SCOPE

The area will be developed in stages, the first stage to be started in 1965. General information was obtained in the entire project area, but specific recommendations apply only to the 1965 project owing to the unknown nature of certain aspects of future development.

SITE DESCRIPTION

The proposed development is at the northwest part of the island, as shown on the attached Plate 1. The area is now used primarily for ammunition storage, materials storage, drill field, and other open-area types of use. Except for the ammunition storage bunkers, the site is nearly level, the extreme elevations being El. +4 to +11, with the major part being between El. +6 and El. +8 above project datum. The larger bunkers are approximately 20 ft in height above grade. They were built in 1944, and are reinforced concrete structures covered by sand, with a surfacing of chert rock and clay, the open side of the structures being protected from blast damage by a backfilled retaining wall of the same height as the bunkers. The storage structures are pile-supported, but the retaining walls are not, according to available structural drawings. Pile lengths are not shown on the drawings. The retaining walls do not appear to have settled significantly more than the pile-supported bunkers, however the retaining walls have cracked slightly due to differential settlement.

The drill field in the southerly part of the site is in lawn, and there are extensive areas of paving, otherwise the ground is bare. Heavy equipment can operate on the bare ground in wet weather even though there is little surface drainage.

Discussions with station personnel during our investigation revealed that portions of the proposed construction area have been used for disposal of debris. Precise locations of the disposal areas are not known at this time, however it is known that pits were excavated to the approximate depth of the water table and debris was dumped into the pits, which were then covered with soil from the excavation. It is known that the disposal areas were generally between the bunkers, that clay soils from construction elsewhere on the site had been deposited in the area of relatively high ground (El. 10 to 11) in the southwesterly corner of the 1965 construction area, and that radioactive and poisonous wastes had been buried west of the abandoned landing strip in a future construction area. The above information was developed during the course of the field investigations.

The project datum is based on the elevation of U. S. C. & G. S. Monument "Strip" as determined at its most recent levelling in 1956. The datum for this levelling was Sea Level, 1929 General Adjustment. A recent levelling by the Twelfth Naval District indicates that the present elevation of the monument is 0.12 ft below its 1956 elevation. Mean lower low water at Treasure Island is 2.99 ft below Sea Level, 1929 General Adjustment, and is the basis for Station elevations (El. 0, MLLW = El. 100, station datum).

The 1965 construction program is in the central part of the entire project, as shown on Plate 1.

REVIEW OF AVAILABLE DATA

a) Construction

According to Mr. Charles Lee, Consulting Engineer, who was associated with its construction, the island was formed in 1936 by hydraulic and clamshell dredging from nearby sand deposits in the bay. The depth of fill was retained by stage placement of a coarse rock rip-rap during the dredging operations. The sand beds from which the fill was obtained contained clay deposits which took the form of balls up to one foot in diameter as it passed through the dredger-pipes and discharged into the fill. Thin-layered silty clay deposits were also formed above the water level where the pumped fill was permitted to pond. Where clay-balls accumulated and layers were formed, attempts were made to disperse the clay deposits by bull-dozing and dragline dredging. The rock rip-rap was originally placed to approximately El. +11, and the general level of the island to El. +10 above sea level. The area of the proposed construction was paved shortly after completion of the island in 1936, and was used during the International Exposition in 1939.

b. Settlement records

Settlement records were maintained for a short period after completion of the fill, the records indicating an initial settlement rate of about 1 in. per year. In 1947, the U. S. Coast and Geodetic Survey established monuments on the island and resurveyed the monuments in 1956. The differences in elevation indicate settlement rates varying from 0.0 to 0.1 ft/yr.

The Twelfth Naval District has also made settlement observations in their checking for differential settlement of Buildings Nos. 363

to 367 in the central part of the island. These buildings are supported on shallow foundations and the records indicate a very small amount of differential settlement and settlement rates of 0.01 to 0.05 ft/yr during the period 1956 to 1964.

Comparison of the present floor elevation with the planned floor elevation of the ammunition storage bunkers located in the 1965 construction area (present floor elevations of other bunkers were not determined) indicate that appreciable settlement has occurred, but the indicated differences in elevation may not reflect accurately the settlement during this period, because it is entirely possible that absolute elevations of the project were not determined at the time of their construction. A tabulation of the elevations follows:

Bunker No.	Planned El.	Present El.
281	+13.2	+9.6
282	+13.8	+10.1
287	+13.4	+10.2

It is of interest to note that although a large amount of settlement has apparently occurred, the pile-supported structure has not settled significantly less than the adjacent spread footing structure. Although not absolutely conclusive because other factors may be involved, it is plausible evidence that the seat of settlement is below the pile tips.

PROPOSED CONSTRUCTION

The quarters to be erected during the 1965 construction program will be 2 story wood frame structures with slabs on grade. Foundation loads will not exceed 2000 lb per ft length, and all foundations will be continuous wall footings, there being no isolated column footings. Two structures will be built requiring excavation to depths of 16 to 18 ft below grade. They are the Storm Water Pump Station and the Sewage Lift Station.

FIELD INVESTIGATIONS

Test borings and trench excavations were made at locations shown on Plate 1.

Four borings (TH1-TH4) of 100 to 120 ft depth were drilled in an attempt to determine the total depth of compressible soils that were known to underly the north end of the island. It was anticipated on the basis of our review of available geological data, that these compressible deposits would not exceed 100 ft in depth, however the relatively incompressible soils that are known to underlie the area at some depth were not encountered within the depth of the borings, although small thicknesses of relatively incompressible sandy soils were found.

Samples were obtained at 5 to 10 ft intervals, using sampling equipment best adapted to the type of soil being sampled. The clayey soils were sampled with an hydraulically-actuated, closed piston sampler (Osterberg type), and with a Shelby-tube sampler. The sandy soils were sampled with an open tube sampler with brass liners.

It was found that the upper 25 to 30 ft of soil is a medium to coarse sand with occasional indications of clay. This sand is probably fill, since the elevations of the base of the sand correspond to the original ground elevation, allowing for a few feet of settlement of the ground underlying the fill. Below the fill were thin-bedded layers of alluvium varying in texture from sand to soft clay to a depth of approximately 50 ft, below which were predominantly medium to stiff silty clays or clayey silts. Layers of coarse alluvium were found below 80 ft depth in three of the four borings, however there is no certain indication that there are no compressible soils below the depth of the borings.

A generalized soil profile based on these four borings and on the known original ground surface elevations is shown on Plate 2. Drilling and sampling techniques are described on Plate 3, and detailed logs of the borings are shown on Plates 4 to 11.

Thirty-six shallow borings (6 ft depth) were drilled to determine the relative density of the upper soils, to determine the incidence of clay-ball accumulations, and to determine free water elevations. At the time of planning the test boring locations, the existence of the debris disposal areas was not known, and the boring locations had not been planned in relation to the location of the disposal areas. To aid in location of the debris disposal areas, at least in the 1965 construction area, trenches were excavated with a backhoe in a known disposal area as well as in areas of uncertainty. The locations of the shallow borings and trench excavations are shown on Plate 1.

Two shallow borings were drilled and cased by hand to permit observation of water level fluctuations. One of these borings was located near the levee and the other distant from the levee to enable comparison of possible tidal fluctuations at these locations. Results of the observations together with times of high and low tides on the dates of observation are shown on Plate 16.

It was found in these shallow explorations that the upper six ft of ground is a medium dense to dense sand fill containing occasional clay-balls and thin silty clay layers, except in the debris disposal areas where there are large concentrations of undecomposed debris. The clay-balls are of soft to stiff consistency, and, in places are accumulated in large groups. The sand in the space between accumulations of clay-balls is loose. Free water was found at El. +0.5 to + +3.5, with at least 67 percent of the observations being between El. +1.2 and +2.8 ft. The mean elevation of the water surface was at El. +2 ft. Measurement of fluctuations of the water surface indicate that tidal fluctuations are slight at the locations investigated but that there may be some rise in the ground water during rainy weather. Conversely, water levels should fall during drying weather, however observations were not made before the start of the seasonal rains, and it is not known to what level the water might drop. It would not be expected that the levels would drop as low as mean tide level, at least in the interior of the site. Mean tide level is approximately at sea level.

Detailed descriptions of conditions found at the test boring and trench locations are shown on Plates 14 and 15.

Two borings were drilled at the proposed sites of the Storm Water Pump Station and the Sewerage Lift Station. These borings had not been planned in the original investigation, but it appeared prudent to obtain information at these specific sites owing to the need during construction of these structures for excavation to an appreciable depth below the water table. Logs of these borings are shown on Plates 12 and 13.

LABORATORY TESTS

The primary purpose of the laboratory investigation was to determine the consolidation characteristics of the compressible materials underlying the fill to enable estimates of total settlement and settlement rates due to the weight of the existing fill and of possible future imposed loads. The consolidation test results are shown on Plates 17, 18, 19, and 20. Tests of specimens from Borings Nos. TH1, TH2 and TH4 were performed on 2.830 in. diameter specimens trimmed from 2-7/8 in. diameter samples. Tests of specimens from Boring No. TH3 were performed on 2.50 in. diameter samples, trimmed from 2-7/8 in. diameter samples. The test data is typical of that obtained for highly silty clay soils, having somewhat poorly defined maximum past pressures, and a large percentage and long duration of secondary compression.

In addition to the consolidation tests, unit weight, moisture content, unconfined compression, plasticity index, and grain size tests were performed for purposes of analyses and classification. Findings from these tests are shown on the boring logs and on Plate 21.

Clayey samples from the shallow test borings were tested to determine their moisture content as an aid in evaluating their strength and compressibility. These test results are shown on Plate 22.

ANALYSIS OF DATA

a. Settlement under existing load conditions

Analyses by conventional techniques based on laboratory data indicate that the ultimate settlement of the compressible soils underlying the fill will eventually be 4 to 6 ft, measured from a time shortly after completion of construction of the island, and that settlement in the next 50 years will be in the order of 1-1/2 to 2 ft. Although time-settlement predictions based on laboratory data are subject to large errors of prediction, the predicted rates of settlement correspond well with actual rates based on available records of settlement, except at the location of U. S. C. & G. S. monument "Strip", which is toward the interior of the island, where it is quite possible that soil conditions differ from those found nearer to the perimeter of the island.

b. Settlement due to additional loads

Settlement of light loads placed over small areas of the clean sand fill will be slight, however settlement in areas containing concentrations of clay-balls would be appreciable, and the debris disposal areas will require treatment before any construction is undertaken. Some settlement will occur under broadly distributed loads, even though the pressure due to these loads may be slight. We estimate that there will be approximately 2-1/2 inches of long duration settlement for each added 100 lb per sq ft of broadly-distributed load, in addition to a small amount of settlement that would occur during and shortly after application of the load.

c. Differential settlement

The upper 50 ft of soils, being sands and thin-bedded silty clays, are completely consolidated under present soil pressures. The seat of current, long-duration settlement is in the thick-bedded, medium-stiff clayey soil below 50 ft depth, therefore differential settlement of the ground surface due to probable variation of soil conditions in the deeper strata and due to small variations in surface loading should be slight. However, if heavy, broadly-distributed loads are applied at the ground surface in the future, there will be considerable settlement of short duration immediately below the loaded area, followed by long-duration settlement due to further consolidation of the deeper soils. The settlement due to consolidation of the deeper soil will spread laterally beyond the limits of the loaded area, thereby reducing the damaging effects of large differential settlements over short distances.

Upon demolition of the ammunition bunkers, there will be swelling of the subsoil due to relief of pressure. We estimate that differential ground movement after demolition will not exceed 1 in. in 50 ft, an indeterminate part of which will occur very shortly after completion of demolition.

d. Design soil pressures

Allowable bearing values for design purposes will depend upon the size, depth and weight of the proposed construction. For that planned for the 1965 program, values not to exceed 2000 lb per sq ft may be assumed, providing that clay-balls and debris are removed from immediately below the foundations.

RECOMMENDATIONS

a. Site Grading

1) Ammunition storage bunkers

The concrete portion of the composite piles should be removed, and the retaining walls should be demolished. The concrete should be removed from the site or should be broken into particles not exceeding 1 ft maximum dimension and placed in reworked fills at a depth not less than 2 ft below the base of foundations. Large accumulations of rubble in the fills should be avoided.

2) Debris disposal areas

The debris should be excavated to an elevation not higher than +2 ft, project datum, the grade exposed by the excavation should be compacted by passage of equipment, the debris thoroughly mixed with clean sand from adjacent excavation, after which it may be replaced in the excavation by tamping with heavy equiment, crushing to eliminate voids. Large pieces of debris that will not reduce to small size by the weight of equipment should be removed. Debris should not be placed above an elevation 2 ft below foundation elevation, and clean sand should be placed over the reworked fill. The sand should be compacted to not less than 95% compaction. (Note: Compaction percentages referred to in this report are based on AASHO Method of Test T180-57.)

3) Clay-balls

Where accumulations of soft clay-balls are found at or immediately below the base of foundations, they should be removed to a depth not less than 2 ft below the base of foundations and should be replaced by clean sand compacted to not less than 95% compaction. Accumulations of clay-balls below foundation depth can be detected by probing with a small diameter rod.

4) Imported Fill

Imported fill materials should have a Plasticity Index not more than 12, and should be placed in the upper one foot of fill. Where used as pavement subgrade, it should have strength values not less than that of the sand on the site as determined by R-value or CBR tests.

5) Drainage gradients

In designing drainage gradients, it should be assumed that the east edge of the site will settle one ft less than the west edge in the next 50 years.

b. <u>Foundations</u>

1) Quarters

Foundations should be placed at a depth not less than 1 ft below lowest adjacent finished grade and not lower than 2 ft above the elevation of the reworked rubble, debris, and clay-ball accumulations. Design bearing pressures should not exceed 1500 lb per sq ft dead load and 2000 lb per sq ft dead plus live load.

2) Storm Water Pump Station and Sewerage Lift Station

Foundations for these structures, which will be below the water table, should be designed as continuous mats, and any soils other than clean granular soils should be removed for a depth of at least 8 inches below the base of the slab and should be replaced with clean sand or gravel. The excavation should be kept dry during construction.

c. Pavements

A pavement section consisting of 2 inches of asphaltic concrete and 4 inches of base rock is recommended. The subgrade should be compacted to Twelfth Naval District standards before construction of the pavement.

CONCLUSIONS

The proposed construction at this site is feasible provided that design anticipates long-range settlement under present loads, that new loads are sufficiently small and are distributed in such a manner that excessive differential settlement will not occur, and that the debris and shallow soft clay deposits are disposed in a manner that will preclude excessive differential settlement.

YERBA BUENA ISLAND

SCOPE

Investigation of the Yerba Buena Island new quarters site was limited to the area of the 1965 construction program. The site location is shown on the attached Plate 23.

SITE DESCRIPTION

Yerba Buena Island is a sandstone protrusion rising from the floor of San Francisco Bay. The sandstone is generally covered by reworked deposits of sand derived from the sandstone, although rock is exposed at the surface in the upper elevations. The natural ground surface has been modified by construction of roads, buildings, and reservoirs. Where the ground has been graded for roadways and buildings, the grading has been accomplished by excavation and filling with the result that the downhill sides of the graded areas are composed of poorly compacted fills and the uphill sides are in rock and dense sand excavation. It appears, also, that materials from the reservoir excavations have been placed in a relatively loose condition on the hillsides.

PROPOSED CONSTRUCTION

Buildings to be constructed are two and three-story buildings of wood and steel frame construction with either frame or slab on grade floors. Foundations will be continuous wall footings loaded to not more than 2000 lb per sq ft and column footings loaded to not more than 50 kips. Retaining walls will be required at certain locations.

The development of the site will require extensive cutting and filling.

FIELD EXPLORATION

Ten test borings were drilled at locations shown on Plate 23. Where possible, the borings were drilled to refusal with a Williams Type Power Auger. Hand auger borings were made in areas that were inaccessible to truck-mounted equipment. The ground surface was also carefully inspected and rock outcrops were mapped, which, together with the boring data, enabled plotting of the approximate location of surface contours of the sandstone rock. The estimated contours are shown on Plate 23, and a typical soil profile through the construction area is shown on Plate 24.

It was found that the surface sands are relatively clean, but are loose near the surface. The underlying sand is dense and slightly cemented. Immediately below the dense sand is a soft sandstone rock. The transition from the sand to the rock is not readily apparent owing to high degree of weathering of the sandstone near the surface and to the cementation of the overlying sand. Our method of distinguishing the cemented sand from the soft sandstone was by use of a slaking test, in which the sands will immediately soften when immersed in water, whereas the sandstone will remain coherent, with only a small amount of slaking.

Boring and sampling techniques are described on Plate 25 and detailed descriptions of conditions found at each boring location are shown on Plate 26.

LABORATORY TESTS

Triaxial shear, unit weight, moisture content, sieve analyses and slaking tests were performed to aid in evaluation of stability and for classification purposes. Results of the tests are shown on Plates 27 to 29.

RECOMMENDATIONS

1. Site grading

a) Fills

The loose fills and loose surface sands where present should be excavated and recompacted during the grading process before covering with fills. There is very little topsoil development, therefore it will not be necessary to strip, except to remove large roots and surface vegetation. All material from required excavation, except that containing vegetation, is considered to be suitable for fill. Fill materials should be compacted to not less than 95% compaction based on AASHO Method of Test T180-57.

Tightly compacted filled slopes should be stable in relation to mass stability, at gradients of 1 - 1/2 horizontal to 1 vertical, however it may be necessary to over-fill and trim to 1-1/2 to 1. The slopes will be susceptible to severe erosion unless they are stabilized by surface treatment such as planting. Concentrations of run-off water should be prevented.

b) Excavation

The sandstone rock throughout the depths to be excavated can normally be excavated by grading equiment without blasting . Hard rock, if encountered should be of limited extent.

Slopes in the materials classified as soft sandstone should be stable at gradients of 1/2 horizontal to 1 vertical, except locally where joints or bedding planes are unfavorable in relation to the geometry of the excavated slopes; in which case slippage may occur normally reducing the gradients to about 1 to 1. There is some hazard of rock fall from 1/2 to 1 slopes, and protection by means of steel fences may be justified at the toe of high, steep cuts in rock.

Slope gradients should be not steeper than 1-1/2 horizontal to 1 vertical in the dense, slightly cohesive sands, and not steeper than 2 horizontal to 1 vertical in loose sand.

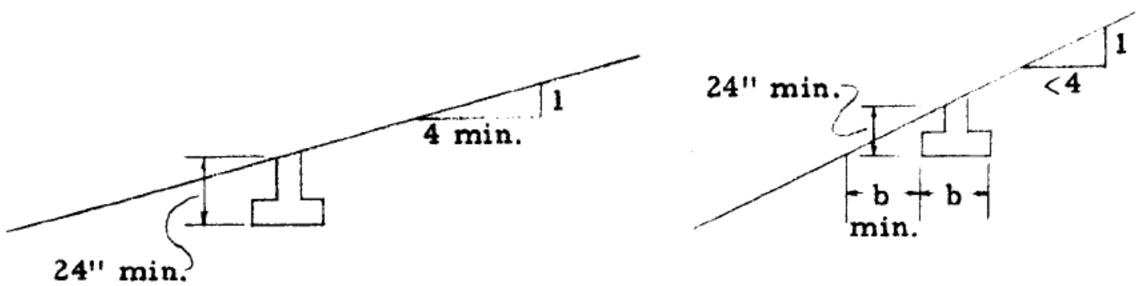
2. Foundations

a) Graded areas

Where site grading is accomplished in accordance with the preceding recommendations, foundations may be placed either in excavated or filled ground, without regard to transition, assuming design foundation pressures not to exceed 2000 lb per sq ft dead load and 3000 lb per sq ft dead plus live load. Foundations should be placed at depths not less than 1 ft below adjacent finished grade elevation.

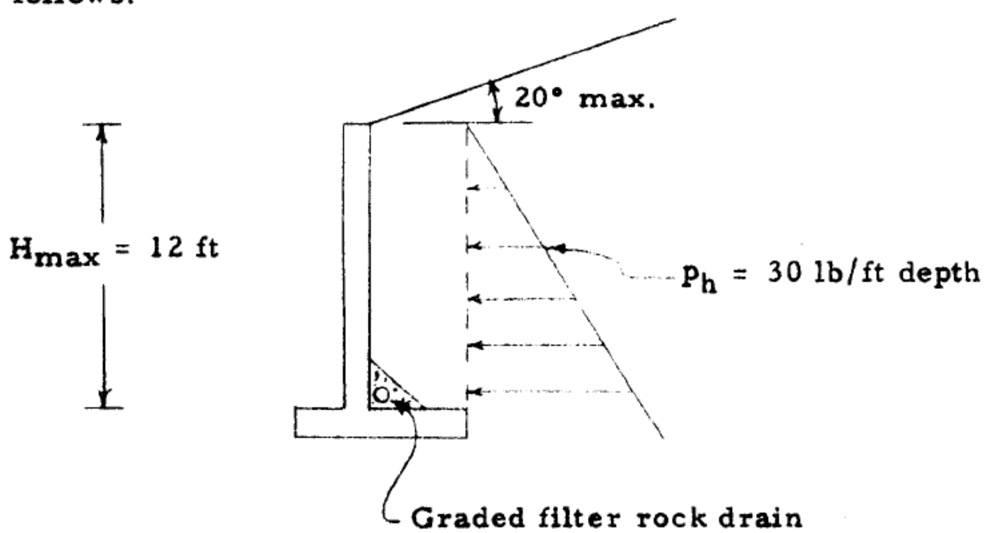
b) Ungraded areas

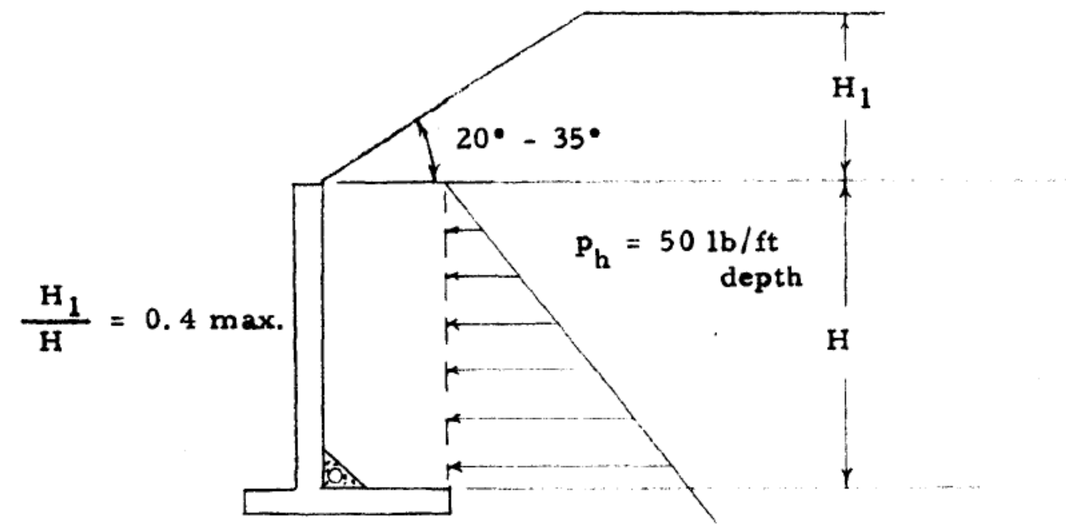
Where site preparation by grading is not required, foundations should be placed in the medium to dense sand below the loose surface sand and below any loose fill that may have been placed in the building area. Minimum depths should be as shown on the following sketch.



3. Retaining wall pressures

Design pressures on retaining walls are recommended as follows:





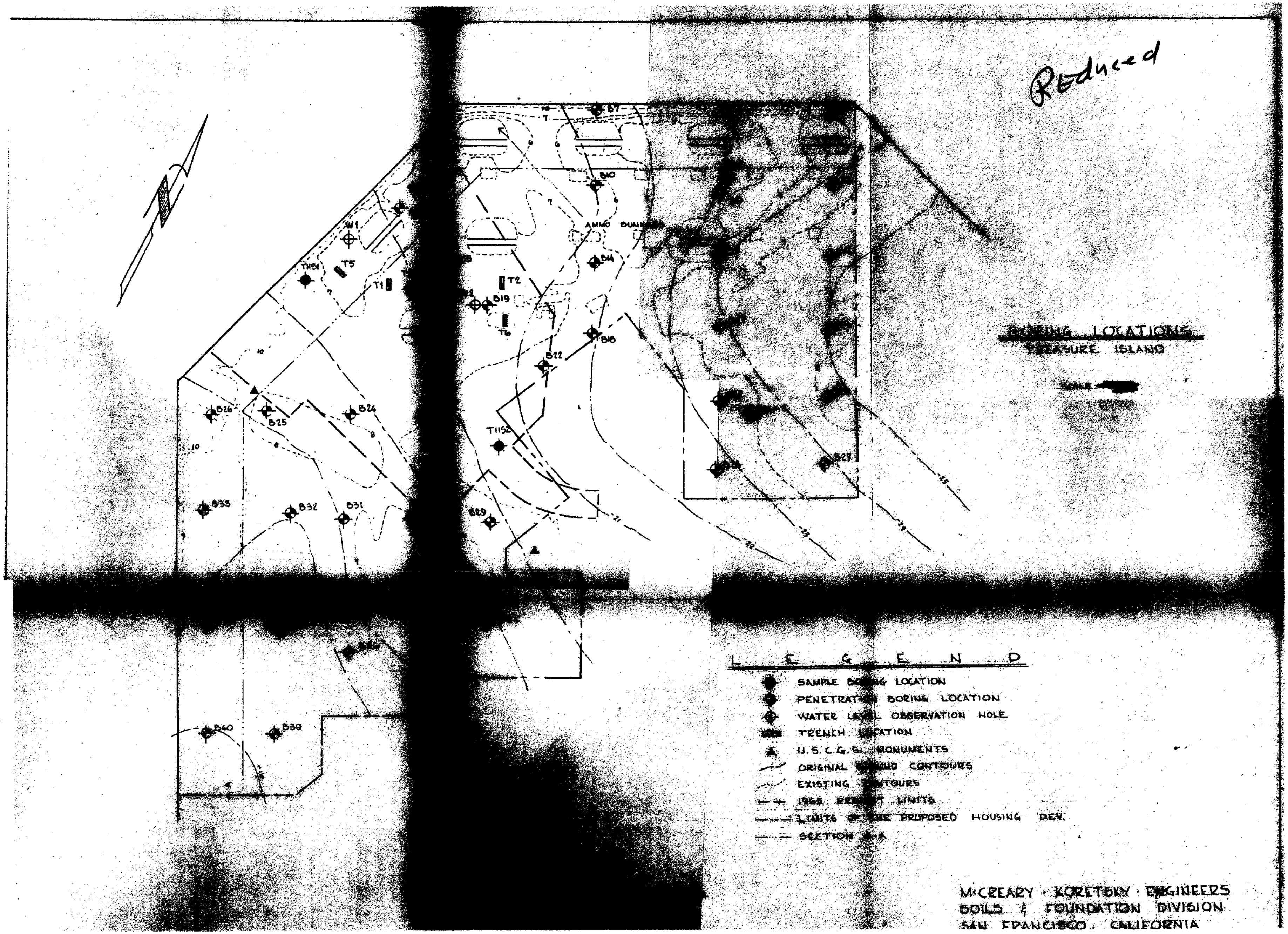
Sand backfill, with drainage - sand from site excavation.

4. Pavements

A pavement section consisting of 2 inches of asphaltic concrete and 4 inches of base rock is recommended. The subgrade should be compacted to Twelfth Naval District standards before construction of the pavement.

ACKNOWLEDGEMENTS

We wish to acknowledge the assistance of Mr. Charles Lee of the firm of Lee and Praszker in providing information regarding the initial construction of Treasure Island, and to express appreciation to the personnel of the Naval Station, Treasure Island, for their cooperation.


Reduced
BORING LOCATIONS
TREASURE ISLAND
B7
B10
AMMO BUNKERS
B14
T2
B19
T6
B18
B22
T1152
B29
W1
T1151
T5
T1
B26
B25
B24
B33
B32
B31
B40
B39
B27
LEGEND
SAMPLE BORING LOCATION
PENETRATION BORING LOCATION
WATER LEVEL OBSERVATION HOLE
TRENCH LOCATION
U.S.C.G.S. MONUMENTS
ORIGINAL GROUND CONTOURS
EXISTING CONTOURS
LIMITS OF THE PROPOSED HOUSING DEV.
SECTION A-A
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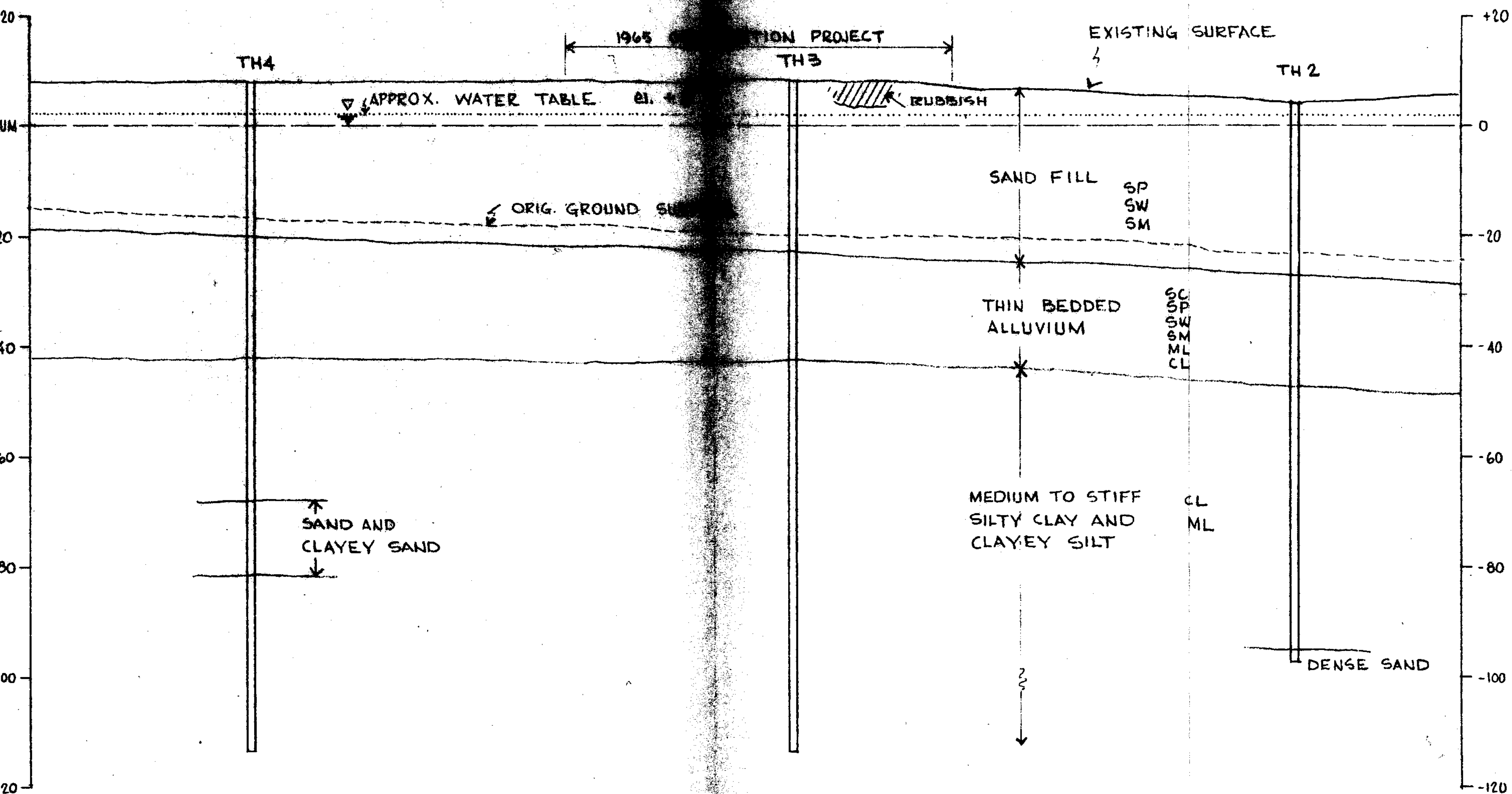

SOIL PROFILE

SECTION A-A

TREASURE ISLAND

SCALE:

HORIZONTAL 1" = 300'

VERTICAL 1" = 20'

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SAN FRANCISCO, CALIFORNIA

DATE JAN. 11, 1965 PROJECT No. 2498

PLATE No. 2

DATE: 1/11/65

Boring Logs, Treasure Island
Supplementary Information

PROJECT No: 2498

Borings Nos. TH1, TH2, TH3, TH4, TH 51, TH 52

1. Drilling equipment - Failing rotary.
2. Sampling equipment
   a) Hydraulically actuated piston sampler, (Osterberg type) 3" O. D., 2-7/8" I. D., brass tubes.
   b) Shelby sampler, open, 3" O. D. x 2-7/8" I. D., steel tubes, advanced by hydraulic jacking.
   c) California type, 2-1/2" O. D. x 2" I. D., with brass liners. Driver 342 lb, 18-inch drop.
3. Symbols
   a) SW, SP, CH, etc. - Unified System group symbols.
   b) "Blows per ft" column

      4, 14, etc. - number blows per ft, California Sampler
      S - Shelby tube sampler
      Os - Osterberg type sampler
      N. R. - No recovery

   c) "Compr. Str." column

      Numbers indicate compressive strength

      C - indicates consolidation test.

Borings Nos. B5 - B40

1. Drilling equipment - Williams auger, 12" diam.
2. Sampling equipment

   California type, 2-1/2" O. D. x 2" I. D. Driver - 140 lb, 30-inch drop.

   Standard penetration, 3" O. D. Driver - 140 lb, 30-inch drop.

Sample designation

TH4-3

TH4 = Boring number

3 = Drive number

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BORING LOG

PROJECT Treasure Island - Quarters	Project No. 2498	Boring No. TH1
LOCATION OF BORING See Plate 1		Sheet No. 1/2
		Date Drilled 11/25-30/64

DEPTH FT.	ELEV. FT.	DRIVE NO.	Blows per Foot	Dry Unit Weight P·C·F	Natural Moist %	Compr. Str. T·S·F	LOG OF MATERIAL
0	7-1/2						Sand, with thin layers of clay, dense. SW-SP CH
10		1	2				
		2	4	-	16.1	-	
20		3	4	-	17.0	-	
		4	14	-	16.0	-	
30		5	34	-	19.7	-	Thin-bedded: sand, silty fine sand, sandy silt, medium silty clay. SC SP SW SM ML CL
		6	2				
40		7	S				
		8	6	-	35.9	-	
50		9	2	-	43.7	-	Many shells.
60							(cont'd)

McCREARY KORETSKY ENGINEERS

BORING LOG

PROJECT Treasure Island - Quarters	Project No. 2498	Boring No. TH1
LOCATION OF BORING		Sheet No. 2/2
		Date Drilled

DEPTH FT.	ELEV. FT.	DRIVE NO.	Blows per Foot	Dry Unit Weight P·C·F	Natural Moist %	Compr. Str. T·S·F	LOG OF MATERIAL
60		10	S				Medium to stiff silty clay and clayey silt. CH-MH
70		11	S	71 71	51.3 51.7	0.91 C	
80		12	S				
90		13	50				Sand, dense. SP
100							Clayey sand, dense. SC
							Bottom of boring.
110							

McCREARY KORETSKY ENGINEERS

BORING LOG

PROJECT Treasure Island - Quarters	Project No. 2498	Boring No. TH2
LOCATION OF BORING See Plate 1		Sheet No. 1/2
		Date Drilled 11/19-20/64

DEPTH FT.	ELEV. FT.	DRIVE NO.	Blows per Foot	Dry Unit Weight P·C·F	Natural Moist %	Compr. Str. T·S·F	LOG OF MATERIAL
0	4						Sand, with thin layers of clay, dense. SW-SP CH
		1	3				
10		2	2	-	15.4	-	
		3	4	-	30.0	-	
20		4	2	-	25.9	-	
		5	1	81	41.2	0.46	
				-	38.1	-	Thin-bedded: sand, silty fine sand, sandy silt, medium silty clay. SC SP SW SM ML CL
30		6	Os	89	35.4	0.39	
				-	49.7	-	
		7	-	69	53.9	0.84	
40		8	Os				
		9	Os				
50		10	Os				Many shells.
		11	Os	75	46.0	C	
				72	49.0	1.01	
60							(cont'd)

McCREARY KORETSKY ENGINEERS

BORING LOG

PROJECT Treasure Island - Quarters	Project No. 2498	Boring No.	TH2
LOCATION OF BORING		Sheet No.	2/2
		Date Drilled	

DEPTH FT.	ELEV. FT.	DRIVE NO.	Blows per Foot	Dry Unit Weight P·C·F	Natural Moist %	Compr. Str. T·S·F	LOG OF MATERIAL
60		12	Os	74 75	46.5 46.7	C 0.98	Medium to stiff silty clay and clayey silt. CH-MH
		13	Os	78	42.7	1.03	
70		14	Os	77 76 80	42.5 45.2 40.7	C - 1.09	
		15	Os	71	51.5	1.21	
80		16	Os	78 70	43.3 52.2	1.76 C	
		17	Os	77	44.1	1.33	
90		18	Os	- 69 69	56.4 52.7 53.8	- C 1.22	
		19		77	43.3	1.43	
100		20					Dense sand. SP
							Bottom of boring.
110							

McCREARY KORETSKY ENGINEERS

BORING LOG

PROJECT Treasure Island - Quarters	Project No. 2498	Boring No.	TH3
LOCATION OF BORING See Plate 1		Sheet No.	1/2
		Date Drilled	11/24-25/64

DEPTH FT.	ELEV. FT.	DRIVE NO.	Blows per Foot	Dry Unit Weight P·C·F	Natural Moist %	Compr. Str. T·S·F	LOG OF MATERIAL
0	7-1/2						Sand, with thin layers of clay, dense. SW-SP CH
10		1	7				
20		2	2	-	49.8	-	
30							
		3	12	-	31.7	-	Thin-bedded: sand, silty fine sand, sandy silt, medium silty clay. SC SP SW SM ML CL
40		4	5	-	35.7	-	
		5	Os	- - - -	30.3 22.6 35.7 25.9	- - - -	
50		6	Os				
		7	Os	67 -	56.9 45.5	C -	Medium to stiff silty clay and clayey silt. CH-MH
60							(cont'd)

McCREARY KORETSKY ENGINEERS

BORING LOG

PROJECT Treasure Island, - Quarters Project No. 2498	Boring No. TH3
LOCATION OF BORING	Sheet No. 2/2
	Date Drilled

DEPTH FT.	ELEV. FT.	DRIVE NO.	Blows per Foot	Dry Unit Weight P·C·F	Natural Moist %	Compr. Str. T·S·F	LOG OF MATERIAL
60		8	Os	77	43.9	C	
		9	Os	77	43.2	0.90	
70		10	Os	81	38.9	C	
		11	Os				
80		12	Os	70	50.7	0.81	
		13	Os	74	43.5	C	
90		14	Os	71	49.7	0.83	
		15	Os	65	58.0	0.93	
100		16	Os	73	47.2	C	
110							
120		17	8				
							Bottom of boring.

McCREARY KORETSKY ENGINEERS

BORING LOG

PROJECT Treasure Island - Quarters	Project No. 2498	Boring No.	TH4
LOCATION OF BORING See Plate 1		Sheet No.	1/2
		Date Drilled	12/1/64

DEPTH FT.	ELEV. FT.	DRIVE NO.	Blows per Foot	Dry Unit Weight P·C·F	Natural Moist %	Compr. Str. T·S·F	LOG OF MATERIAL
0	6-1/2						Sand, with thin layers of clay, dense. SW-SP CH
10		1	3	-	16.3	-	
20		2	3	-	37.1	-	
30		3	S				Thin-bedded: sand, silty fine sand, sandy silt, medium silty clay. SC SP SW SM ML CL
		4	3	-	26.9	-	
40		5	6	-	35.0	-	
50		6	7	-	53.4	-	Medium to stiff silty clay and slayey silt. CH-MH
60							(cont'd)

McCREARY KORETSKY ENGINEERS

BORING LOG

PROJECT	Treasure Island - Quarters	Project No. 2498	Boring No. TH4
LOCATION OF BORING			Sheet No. 2/2
			Date Drilled

DEPTH FT.	ELEV. FT.	DRIVE NO.	Blows per Foot	Dry Unit Weight P·C·F	Natural Moist %	Compr. Str. T·S·F	LOG OF MATERIAL
60		7	S	72	50.0	0.67	
70		8	S	80	39.2	0.60	
							Clayey sand, dense. SC
80		9	S				Stiff silty clay. CH-CL
							Sand, dense. SP
90		10	6	73	46.8	0.63	Stiff silty clay. CH-CL
							Sandy clay. SC
100		11	5	78	42.7	0.76	Stiff silty clay. CH-CL
110							
							Stiff clayey silt. MH
120		12	S	78 79	42.3 40.2	C 0.64	
							Bottom of boring.

McCREARY KORETSKY ENGINEERS

BORING LOG

PROJECT Treasure Island - Quarters	Project No. 2498	Boring No. TH 51
LOCATION OF BORING Storm-water pump station site		Sheet No. 1/1
		Date Drilled 12/29/64

DEPTH FT.	ELEV. FT.		DRIVE NO.	Blows per Foot	Dry Unit Weight P·C·F	Natural Moist %	Compr. Str. T·S·F	LOG OF MATERIAL	
0	7-1/2							Sand, trace clay.	SM
			1	14				Sand and debris.	
								Sand and fine gravel.	
			2	35					SP
10									
		1A	3	5				Sand and soft silty clay.	SP CL, SC
		2A	4	0					
					96	28.3	-	Silty very fine sand with clay layers.	
			5	S					
20			6	5					SM CL
		3A		S	94	30.1	0.55		
		4A		10					
								Bottom of boring.	
30									

Note: Hole caving above 20 ft depth. Drilled adjacent hole, with casing to 12 ft depth.

McCREARY KORETSKY ENGINEERS

BORING LOG

PROJECT Treasure Island - Quarters	Project No. 2498	Boring No.	TH 52
LOCATION OF BORING Sewerage lift station		Sheet No.	1/1
		Date Drilled	12/29/64

DEPTH FT.	ELEV. FT.	DRIVE NO.	Blows per Foot	Dry Unit Weight P·C·F	Natural Moist %	Compr. Str. T·S·F	LOG OF MATERIAL
0	6-1/2						Sand, thin layers of stiff clay. SW-SP CL
		1	10				
10							
		2	11				
				108	21.8	-	Clayey sand. SC
		3	5	78	44.2	0.34	Soft silty clay. CL
				78	43.8	-	
				99	26.5	-	Silty fine sand, layers of soft silty clay. SM CL
		4	3 N.R.				
20							
		5	S N.R.				
		6	6 N.R.				
							Bottom of boring.

PENETRATION RESISTANCE LOGS
BORINGS B5 TO B40

DATE DRILLED	BORING NO.	ELEV., FT.	DEPTH 0 - 1 DESCRIPTION	DEPTH 1 - 2 DESCRIPTION	1 - 2 NO. BLOWS PER FOOT	DEPTH 2 - 3 DESCRIPTION	DEPTH 3 - 4 DESCRIPTION	3 - 4 NO. BLOWS PER FOOT	DEPTH 4 - 5 DESCRIPTION	DEPTH 5 - 6 DESCRIPTION	5 - 6 NO. BLOWS PER FOOT	WATER SURFACE DEPTH	WATER SURFACE EL.
12/4	B 5	7.5	RUBBISH	RUBBISH	40	SAND	SAND		SAND	SAND	32		-
12/4	6	6.0	SAND	RUBBISH		RUBBISH	SAND	47	SAND	SAND		4.5	1.5
12/4	7	7.5	SAND, RUBB.	SAND, RUBB.	47	SAND	SAND		SAND	SAND	30	5.5	2.0
12/4	8	6.5	SAND, A. C.	SAND		SAND	SAND	21	SAND	SAND		5.0	1.5
12/4	9	4.5	SAND, A. C.	SAND	16	SAND	CLAY, 6'		SAND	CLAY	5	2.5	2.0
12/4	10	6.0	SAND, A. C.	SAND		SAND	SAND	14	SAND	SAND		-	-
12/4	11	6.5	SAND, CLAY	SAND	38	SAND	SAND		SAND	SAND	10	4.5	2.0
12/4	12	7.5	SAND	SAND	7	SAND	SAND		SAND	CLAY, 6'	16	-	-
12/4	13	6.0	SAND	SAND		SAND	SAND	12	SAND	SAND		5.0	1.0
12/4	14	6.5	SAND	SAND	21	SAND	SAND		SAND	CLAY, 6'	6	3.5	3.0
12/7	15	7.5	SAND	SAND		SAND	SAND	15	SAND	SAND		5.5	2.0
12/7	16	8.0	SAND	SAND		SAND	SAND	19	SAND	SAND		-	-
12/7	17	7.0	SAND	SAND, CLAY		SAND	SAND	23	SAND	SAND		5.0	2.0
12/7	18	7.0	SAND, A. C.	SAND	27	SAND	CLAY		SAND	SAND	13	3.5	3.5
12/7	19	7.5	SAND, A. C.	SAND	11	SAND	SAND		SAND	SAND	8	-	-
12/7	20	8.0	SAND	SAND	15	SAND	SAND		SAND	SAND	18	6.0	2.0
12/7	21	6.5	SAND	SAND	24	SAND	SAND		SAND	SAND, CLAY	4	4.0	2.5
12/7	22	6.5	SAND, A. C.	SAND		SAND	SAND	15	SAND	SAND		3.0	3.5
12/7	23	7.0	SAND, A. C.	SAND	14	SAND, CLAY	SAND		SAND	SAND	5	4.0	3.0
12/7	24	7.5	SAND, A. C.	SAND		SAND	SAND	16	SAND	SAND		5.0	2.5
12/7	25	8.5	SAND, A. C.	SAND	36	SAND	SAND		SAND	SAND	15	-	-
12/7	26	11.0	SAND, CLAY	SAND, CLAY.		SAND, CLAY	SAND AND RUBBISH TO 5' DEPTH					10.5	0.5
12/7	27	7.5	SAND, A. C.	SAND		SAND	SAND	16	SAND	SAND		-	-
12/7	28	6.5	SAND	SAND		SAND	SAND	11	SAND	SAND		3.5	3.5
12/7	29	7.5	SAND, A. C.	CL. SAND	32	RUBBISH, 6'	SAND		SAND	SAND		5.5	2.0
12/7	30	7.0	SAND, A. C.	SAND		SAND, CLAY	SAND	31	SAND	SAND		5.0	2.0
12/8	31	6.5	SAND	SAND		SAND	SAND	11	SAND	SAND		5.0	1.5
12/8	32	7.5	SAND	SAND	22	SAND	SAND		SAND	SAND	16	-	-
12/8	33	7.5	SAND, A. C.	SAND, CLAY		SAND, CLAY	CLAY	25	CLAY	CLAY, SAND		6.0	1.5
12/8	34	-	SAND	SAND	20	SAND	SAND		SAND	SAND	6	5.0	-
12/8	35	-	SAND, CLAY	SAND		SAND	SAND	17	CLAY	SAND		5.0	-
12/8	36	-	SAND	SAND	26	SAND	SAND		SAND	SAND	10	5.5	-
12/8	37	-	SAND, A. C.	SAND	16	SAND	SAND		SAND	SAND	14	-	-
12/8	38	-	SAND, A. C.	SAND, CLAY		SAND	SAND	14	SAND	SAND		5.0	-
12/10	39	-	SAND, A. C.	SAND		SAND	SAND	10	SAND	SAND		-	-
12/9	40	-	SAND	SAND		SAND	SAND	13	SAND	SAND		5.0	-

Notes: (1) Elevations to nearest 1/2 ft.
(2) Water depths to nearest 1/2 ft., observed at time of drilling.
(3) Penetration Resistance - Standard Penetration Sampling - 140# hammer, 30" drop.
(4) A.C. - indicates asphaltic concrete.
(5) Clay, where noted, is in the form of balls and thin layers.

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SAN FRANCISCO

DATE: 1/11/65

Treasure Island
Trench Excavations

PROJECT No: 2498

Location	Remarks
T1	Rubbish to 4 ft depth below ground surface, consisting of cans, bottles, paper, etc., large voids. Seepage at 4-1/2 ft depth.
T2	Clean sands to 5 ft depth. Seepage at 5 ft. depth.
T3	Sand with occasional clay lumps to 6 ft depth; clayey sand at 6 ft depth, seepage at 6 ft depth
T4	Approximately 6 in. of sand over asphalt pavement. Sand with occasional clay lumps to 5 ft depth. Seepage at 4-1/2 ft depth.
T5	Approximately 6 in. of sand over asphalt pavement. Sand with occasional clay lumps to 5 ft depth. Seepage at 4-1/2 ft depth.
T6	Sand with many clay lumps in upper 2 to 3 ft. Clean sand from 3 to 5 ft depth with occasional clay lumps.

Note: Trenches approximately 25 ft in length, excavated by backhoe.

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SAN FRANCISCO

DATE: 1/11/65

Treasure Island
Water Level Observation

PROJECT No: 2498

Location		W - 1		W - 2
Ground Elev.		+6.4		+7.6
Date	**Time**	**Water Elev.**	**Time**	**Water Elev.**
12/18/64	1012	1.30	1015	1.94
	1105	1.33	1108	1.94
	1155	1.38	1158	1.94
	1338	1.48	1335	1.94
	1419	1.58	1423	1.94
	1450	1.59	1453	1.94
	1523	1.59	1526	1.94
	1549	1.59	-	-
12/19/64	1140	1.50	1120	1.94
12/22/64	1200	1.90	1150	2.68

Notes:

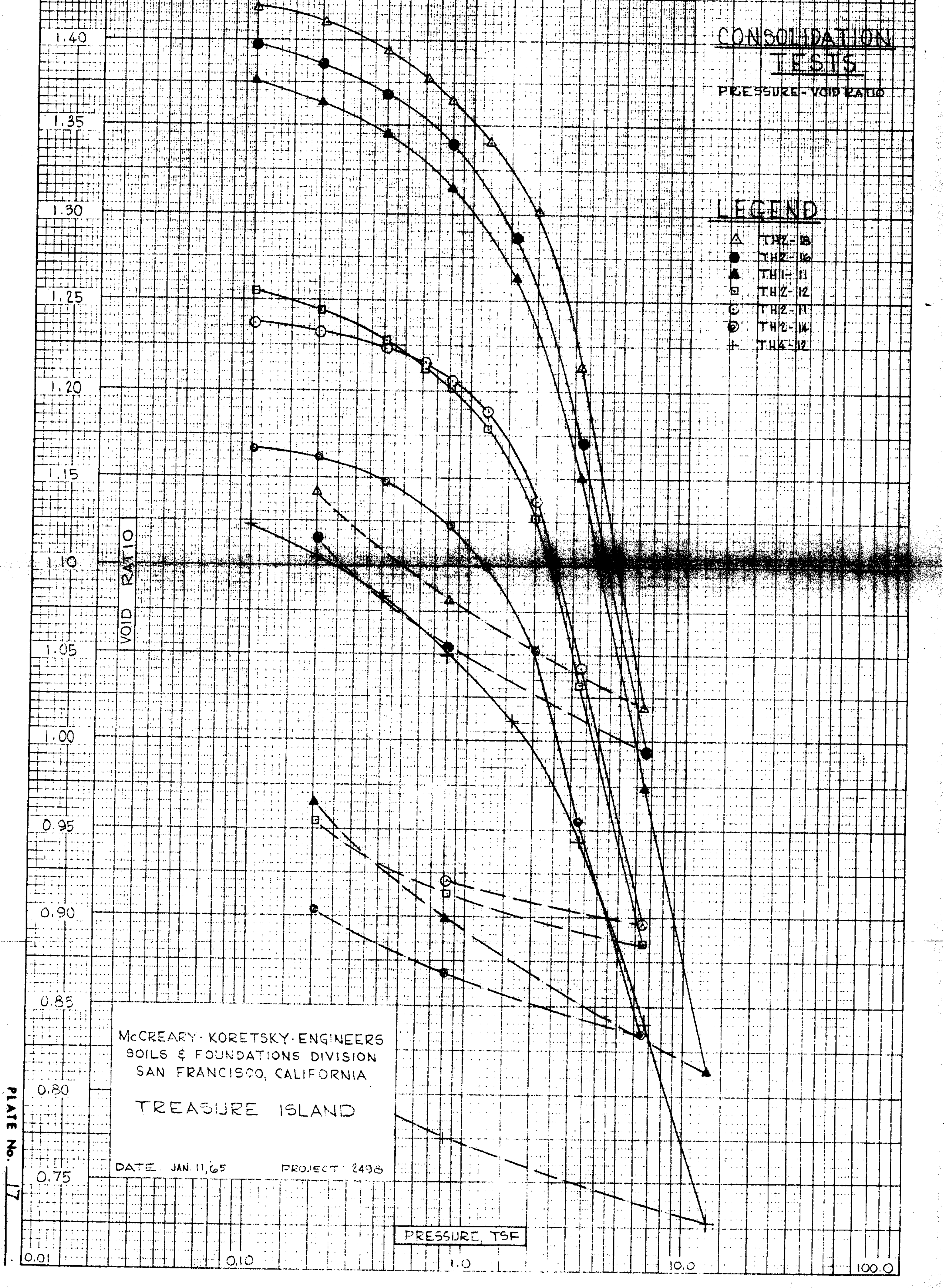
1) Drilled and casing installed to 12 inches below free water surface on 12/17/64.

2) Differences in elevation are accurate to ±0.01 ft. Actual elevations were interpolated from topographic map, not independently leveled.

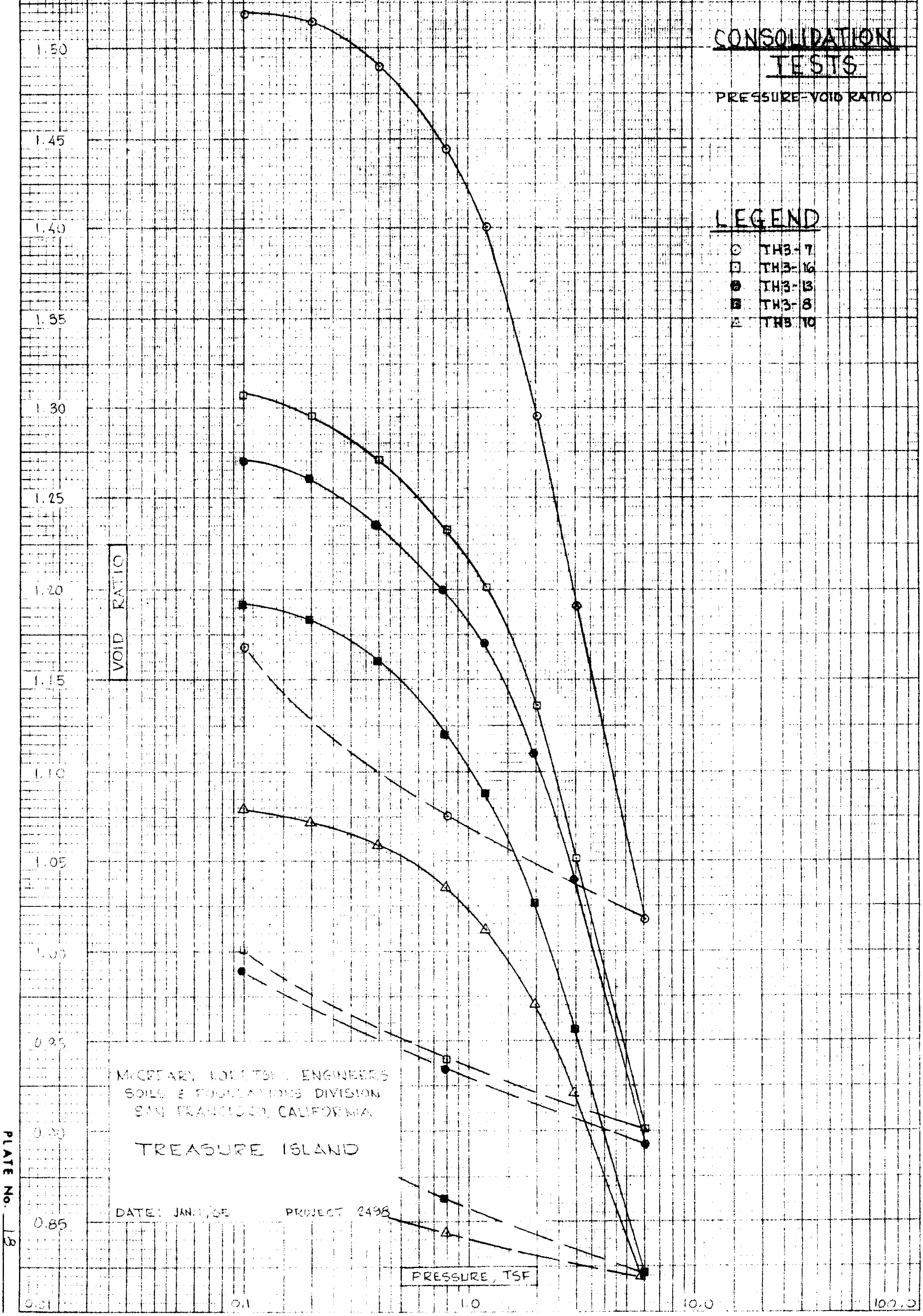
3) Tidal data (from published records)

Date	Time at High Tide	Time at Low Tide
12/18/64	1023	1749
12/19/64	1108	1837
12/22/64	1341	2107

4) Heavy rains occurred during period 12/19 to 12/22.



CONSOLIDATION TESTS
PRESSURE - VOID RATIO
LEGEND
TH2-13
TH2-16
TH1-11
TH2-12
TH2-11
TH2-14
TH4-12
VOID RATIO
1.40
1.35
1.30
1.25
1.20
1.15
1.10
1.05
1.00
0.95
0.90
0.85
0.80
0.75
PRESSURE, TSF
0.01
0.10
1.0
10.0
100.0
McCREARY · KORETSKY · ENGINEERS
SOILS & FOUNDATIONS DIVISION
SAN FRANCISCO, CALIFORNIA
TREASURE ISLAND
DATE JAN 11, 65
PROJECT 2498
PLATE No. 17



CONSOLIDATION TESTS
PRESSURE-VOID RATIO
LEGEND
TH3-7
TH3-16
TH3-13
TH3-8
TH3 10
VOID RATIO
1.50
1.45
1.40
1.35
1.30
1.25
1.20
1.15
1.10
1.05
0.95
0.85
TREASURE ISLAND
PROJECT 2498
PRESSURE, TSF
0.1
1.0
10.0
PLATE NO. 18

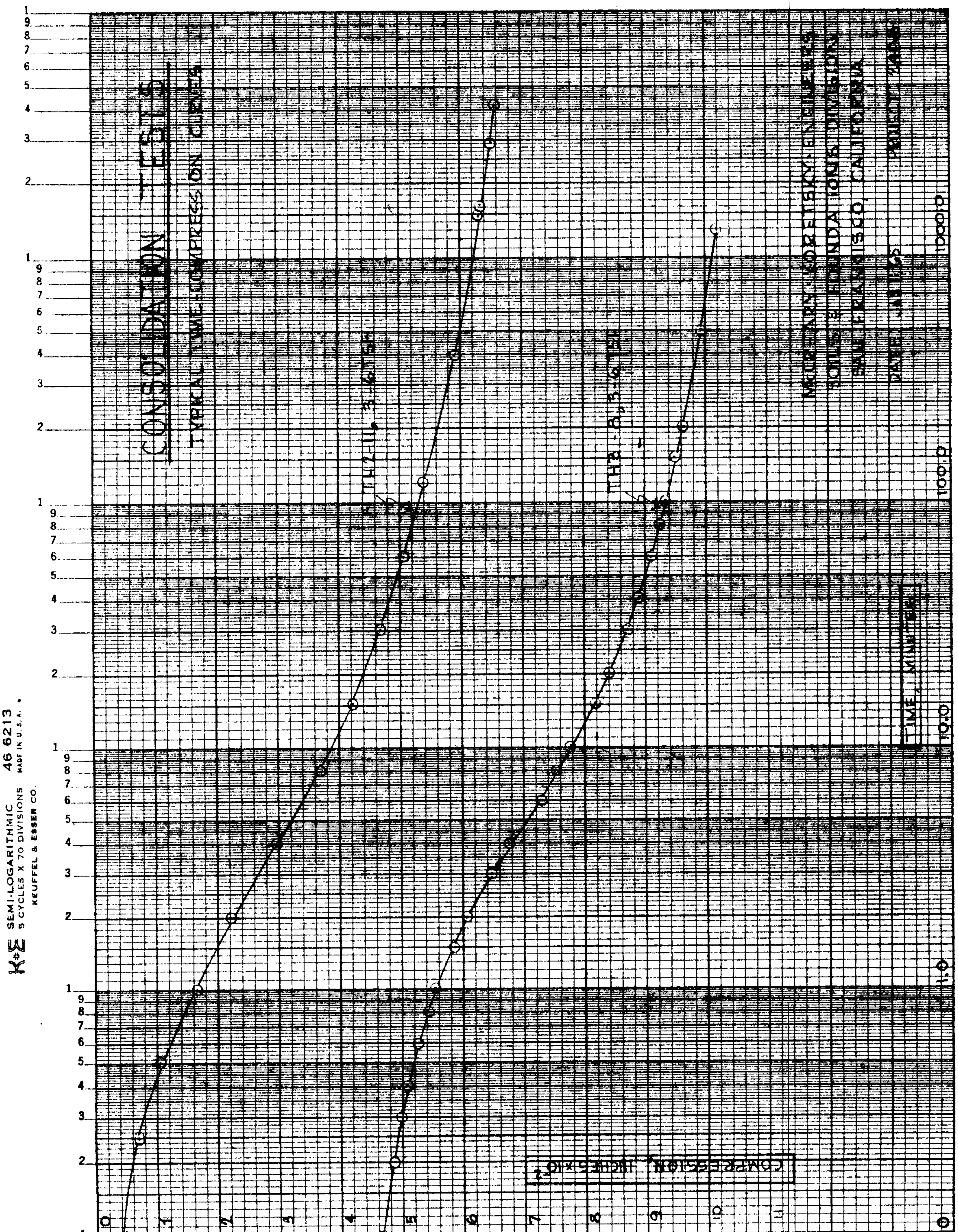

CONSOLIDATION TESTS
TYPICAL TIME-COMPRESSION CURVES
McCREARY KORETSKY ENGINEERS
SOILS & FOUNDATIONS DIVISION
SAN FRANCISCO CALIFORNIA
TIME, MINUTES
COMPRESSION, INCHES x10^-2
1.0
10.0
100.0
1000.0
K+E SEMI-LOGARITHMIC 46 6213
5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.

PLATE NO. 19

Treasure Island

Consolidation Test Summary

Boring No.	TH1	TH2					TH3					TH4
Sample No.	11	11	13	14	16	18	7	8	10	13	16	12
Depth, ft	71	56	61	71	81	91	55	62	72	87	102	120
Unit Weight, lb/cu ft	70	75	74	77	70	69	67	76	81	74	73	78
Void Ratio, initial	1.375	1.235	[illegible]	1.165	1.395	1.420	1.520	1.190	1.080	1.270	1.305	1.125
Moisture Content, %	51.7	46.0	[illegible]	42.5	52.2	52.7	56.9	43.9	38.9	43.5	47.2	42.3
Compression Index	0.560	0.490	[illegible]	0.423	0.592	0.637	0.587	0.480	0.362	0.475	0.433	0.379
Consolidation Coefficient, ft^2/day	0.06	0.17	[illegible]	0.20	0.08	0.09	0.06	0.13	0.15	0.35	0.21	0.49
Overburden pressure, p_1, tsf - Note (1)	2.25	1.75	[illegible]	2.13	2.38	2.63	1.80	1.97	2.24	2.59	2.97	3.36
Existing effective pressure, $\overline{p_e}$, tsf - Note (2)	1.65	1.75	[illegible]	1.60	1.80	1.85	-	-	-	-	-	-
Initial pressure, $\overline{p_o}$, tsf - Note (1)	1.02	0.80	[illegible]	1.18	1.43	1.67	-	-	-	-	-	-
Pore pressure ratio	0.51	1.0	0.71	0.44	0.39	0.19	-	-	-	-	-	-

Notes:

(1) Calculated from effective surcharge weight.

(2) Estimated from consolidation test data.

(3) Pore pressure ratio

$$= \frac{\text{Estimated existing pore pressure}}{\text{Effective stress difference}}$$

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SOILS & FOUNDATIONS DIVISION
SAN FRANCISCO, CALIFORNIA

DATE 1/11/65 PROJECT No. 2498

PLATE No. 20

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SAN FRANCISCO

DATE: 1/11/65

Treasure Island
Miscellaneous Test Data

PROJECT No: 2498

Grain-Size Analysis
Summary

Boring No.	TH2	TH2	TH2	TH2	TH2	TH2	TH51
Sample No.	6	11	12	14	18	20	3
	% Passing or % Finer						
Sieve Size							
U. S. No. 4						100	
U. S. No. 8			100			99	
U. S. No. 16	100		99			99	
U. S. No. 30	99		98			99	100
U. S. No. 50	99	100	98			99	99
U. S. No. 100	90	99	97	100		18	63
U. S. No. 200	72	91	94	92	99	12	42
Size, mm							
0.05	-	67	78	77	97	-	-
0.005	-	26	33	29	59	-	-
0.001	-	12	15	13	30	-	-

Plasticity Index Tests
Summary

Boring No.	TH1	TH2	TH2	TH2	TH2	TH2
Sample No.	11	6	8	9	13	19
Liquid Limit	51	30	35	35	37	42
Plastic Limit	25	-	20	18	20	25
Plasticity Index	26	Non-plastic	15	17	17	17

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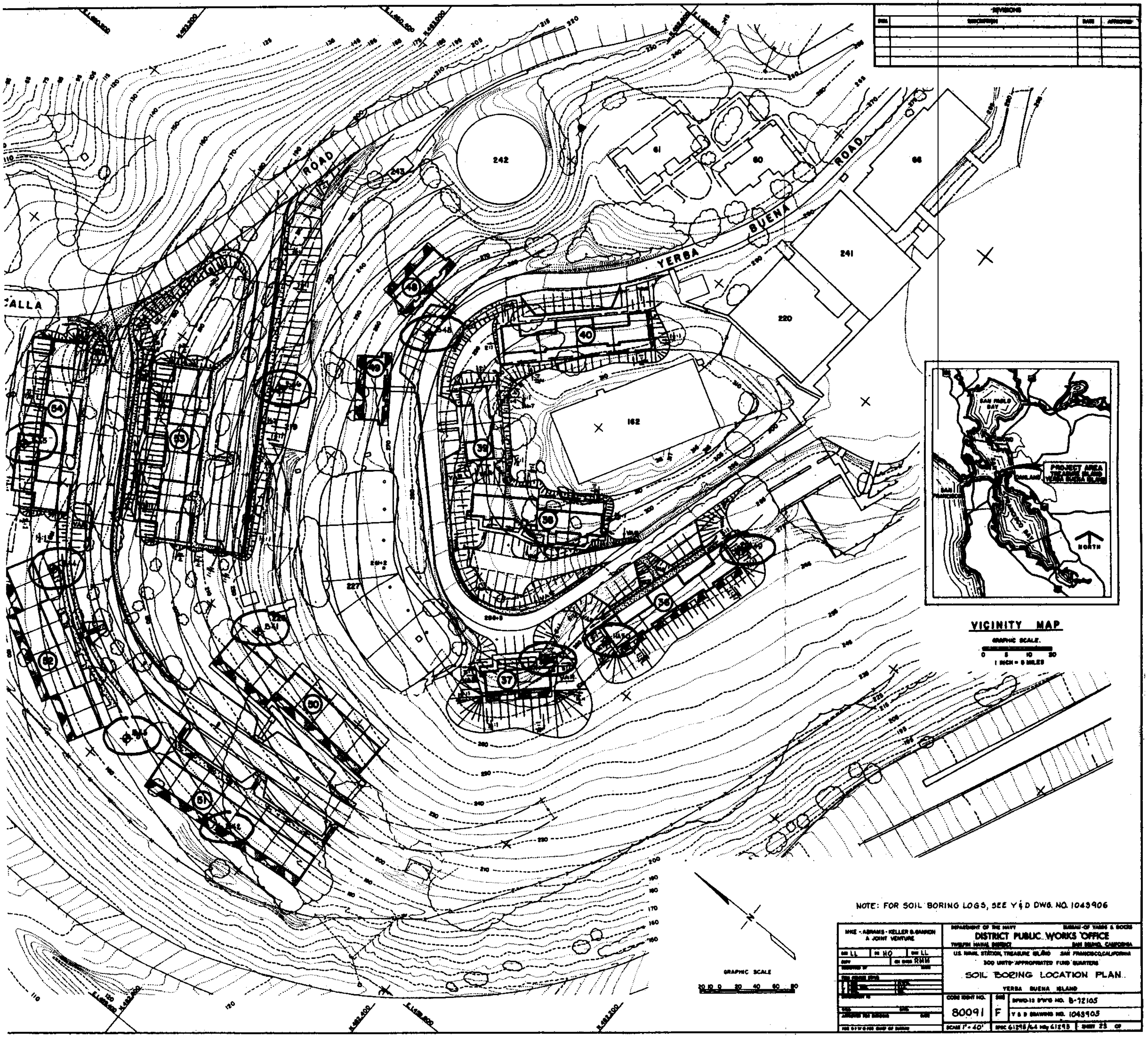
SAN FRANCISCO

DATE: 1/11/65 PROJECT No: 2498

Treasure Island

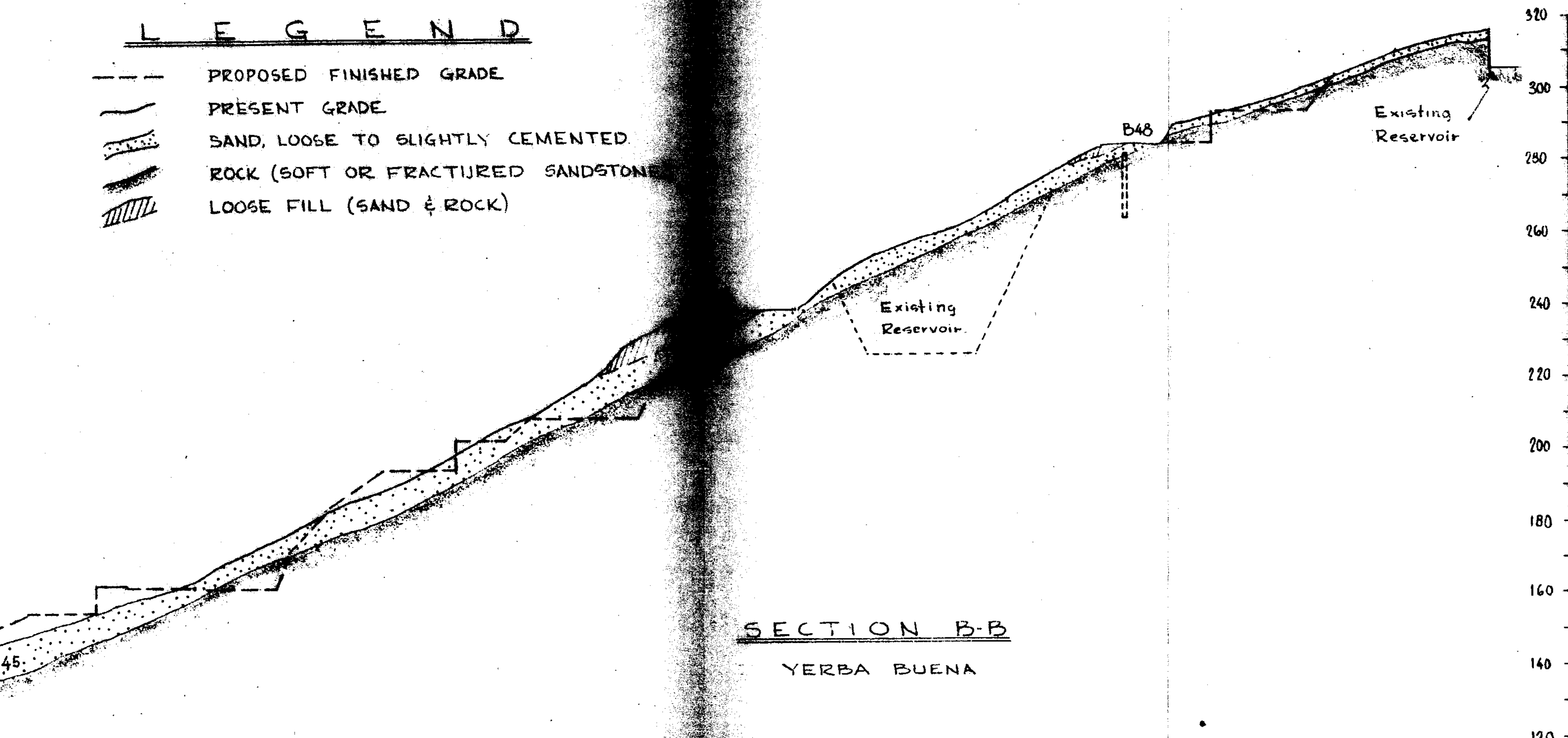
Moisture Content of
Clayey Samples Obtained from
Upper 6 ft (B-Series Borings)

Boring No.	Depth, ft	Moisture Content	Description
B18	3	68.0	Soft silty clay.
B19	1	25.0	Stiff silty clay.
B19	1-1/2	26.3	Stiff silty clay.
B19	2	32.4	Stiff silty clay.
B26	1-1/2	23.6	Medium stiff silty clay.
B26	2-1/2	18.0	Medium silty clay.
B30	2-1/2	32.4	Medium silty clay.



NOTE: FOR SOIL BORING LOGS, SEE Y & D DWG. NO. 1043906

MKE - ABRAMS - KELLER & GANNON A JOINT VENTURE	DEPARTMENT OF THE NAVY — BUREAU OF YARDS & DOCKS DISTRICT PUBLIC WORKS OFFICE TWELFTH NAVAL DISTRICT — SAN BRUNO, CALIFORNIA
LL / HO / LL / RMM	U.S. NAVAL STATION, TREASURE ISLAND SAN FRANCISCO, CALIFORNIA 300 UNITS APPROPRIATED FUND QUARTERS SOIL BORING LOCATION PLAN. YERBA BUENA ISLAND
CODE IDENT NO. 80091	SIZE F
DPWO-12 DWG NO. B-72105	Y & D DRAWING NO. 1043905
SCALE 1" = 40'	SPEC 61298/64 NBy 61298	SHEET 23 OF



SECTION B-B

YERBA BUENA

SCALE
HORIZONTAL 1" = 40'
VERTICAL 1" = 30'

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SOILS & FOUNDATIONS DIVISION
SAN FRANCISCO, CALIFORNIA

DATE JAN. 11, 1965 PROJECT No. 2498

PLATE No. 24

Test Boring Logs

Yerba Buena Island

o.
led
, ft

B 41
12/9/64
224

Sample	Blows	Description	Class
		Sand and rock fill, loose.	
1			SW-SM
		Sand and rock, dense.	SW
4		(Triax.)	
		Soft sandstone.	
	30		
		Auger refusal.	

B 42
12/10/64
172

Sample	Blows	Description	Class
		Silty sand, loose.	SM
1	13	Silty sand, dense.	SM
		Lightly cemented sand.	
2	44	(Triax.)	SW
		Soft sandstone.	
3	225		
		Auger refusal.	

B 43
12/10/64
167

Sample	Blows	Description	Class
1	7	Silty sand, loose.	SM
		Silty sand, dense.	SM
2	23		
		Sand, medium grain size, slightly cemented.	
3	39	(Triax.)	SW-SP
4	150	Soft sandstone.	
		Auger refusal.	

B 44
12/10/64
163

Sample	Blows	Description	Class
		Sand, trace fines, loose to medium-dense.	
1	7		SW-SM
2	40		
		Cemented sand.	SW-SP
3	60	Soft shale and sandstone.	
4	85		
		Auger refusal.	

B 45
12/10/64
145

Sample	Blows	Description	Class
		Silty sand, loose to medium dense.	
1	13		SM
2	22	Sand, medium grain size, dense.	SW-SP
3	120	Soft sandstone.	
		Auger refusal.	

0
5
10
15

o.
led
, ft

B 46
12/10/64
232

Sample	Blows	Description	Class
		Sand, and rock fill, loose.	SM
		Sand, medium-dense.	SM
	21		
		Hole caving.	

B 47
12/10/64
282

Sample	Blows	Description	Class
		Sand and rock fill, loose.	
1	12		SM
		Soft sandstone.	
2	40		
		Auguer refusal.	

B 48
12/10/64
281

Sample	Blows	Description	Class
		Silty fine sand, loose.	
1	6		SM
2	25	Fine sand, dense.	SW-SM
3	80	Soft sandstone.	
4	120		
		Auger refusal.	

HA 49
12/17/64
273

Description	Class
Loose silty sand.	SM
Dense silty sand.	SM
Cemented sand.	SM
Hand auger refusal.	

Note: Approx. 2 ft high embankment of rock and sand fill adjacent and east of boring location.

HA 50
12/17/64
287

Description	Class
Loose silty sand.	SM
Cemented sand.	SM
Hand auger refusal.	

0
5
10

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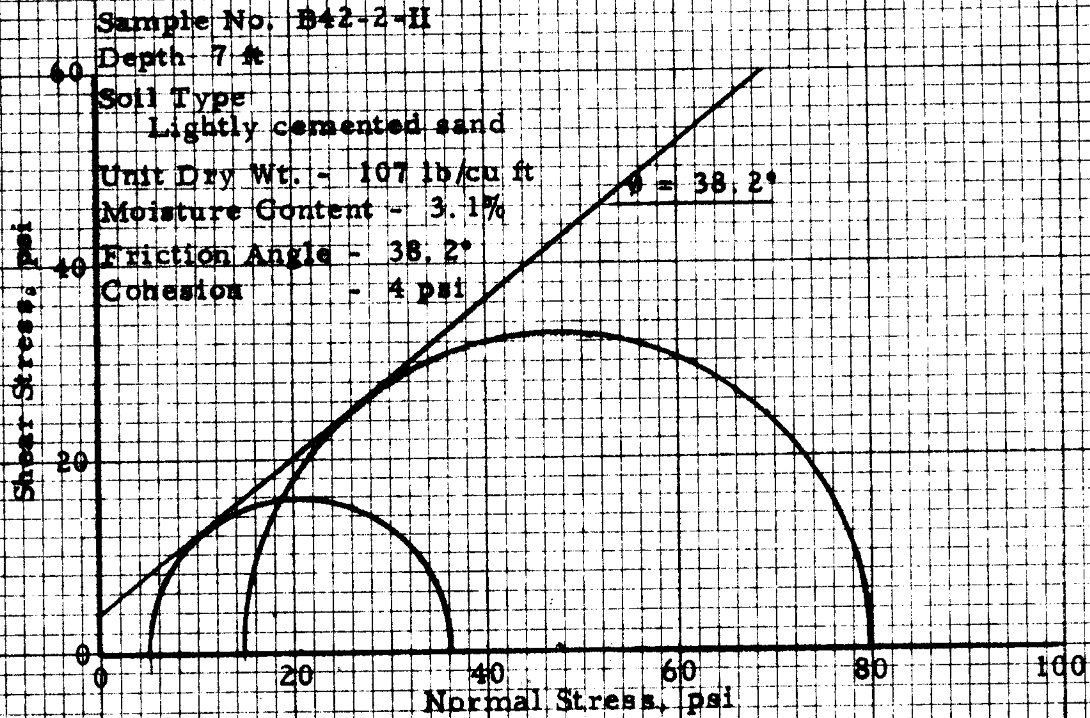
SOILS & FOUNDATIONS DIVISION
SAN FRANCISCO, CALIFORNIA

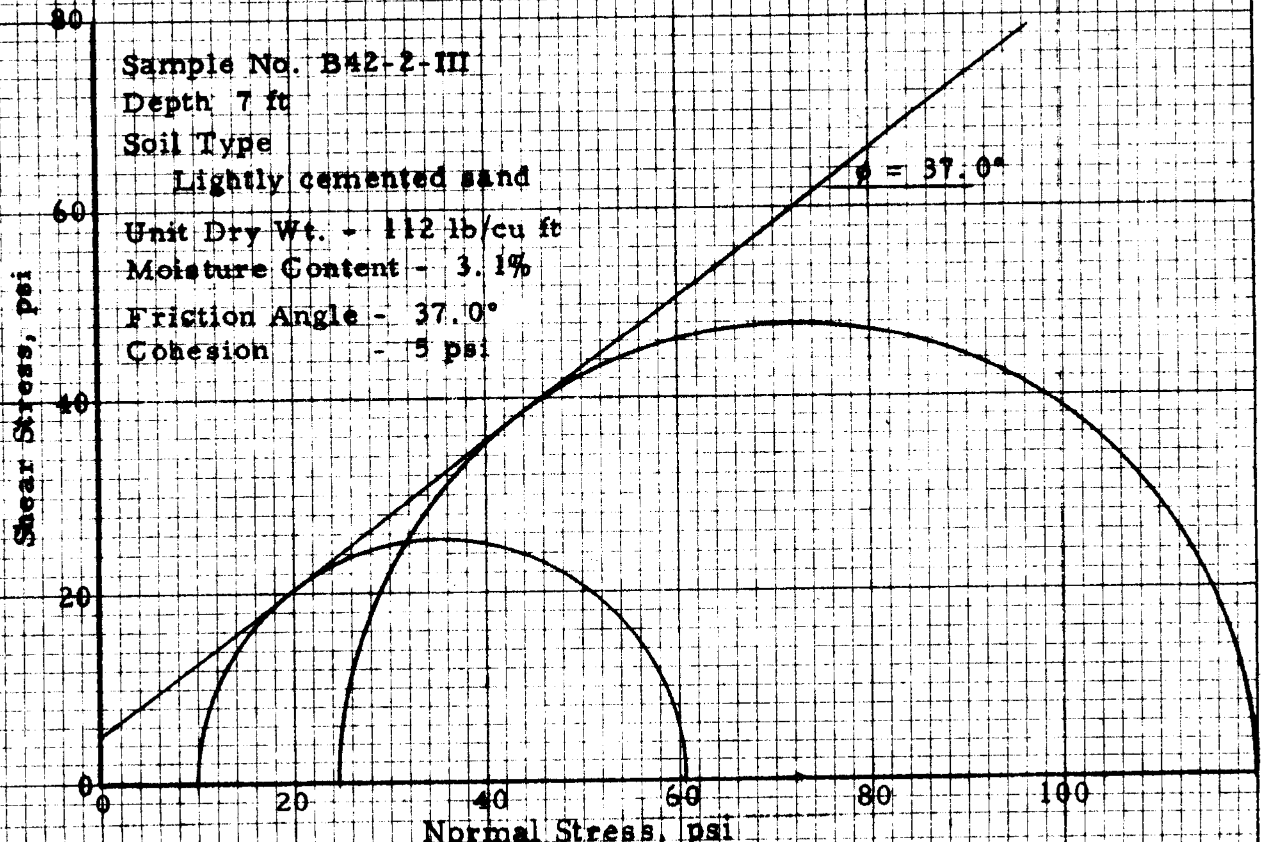
DATE 1/11/65 PROJECT No. 2498

PLATE No. 26

Yerba Buena Island

Triaxial Shear Tests





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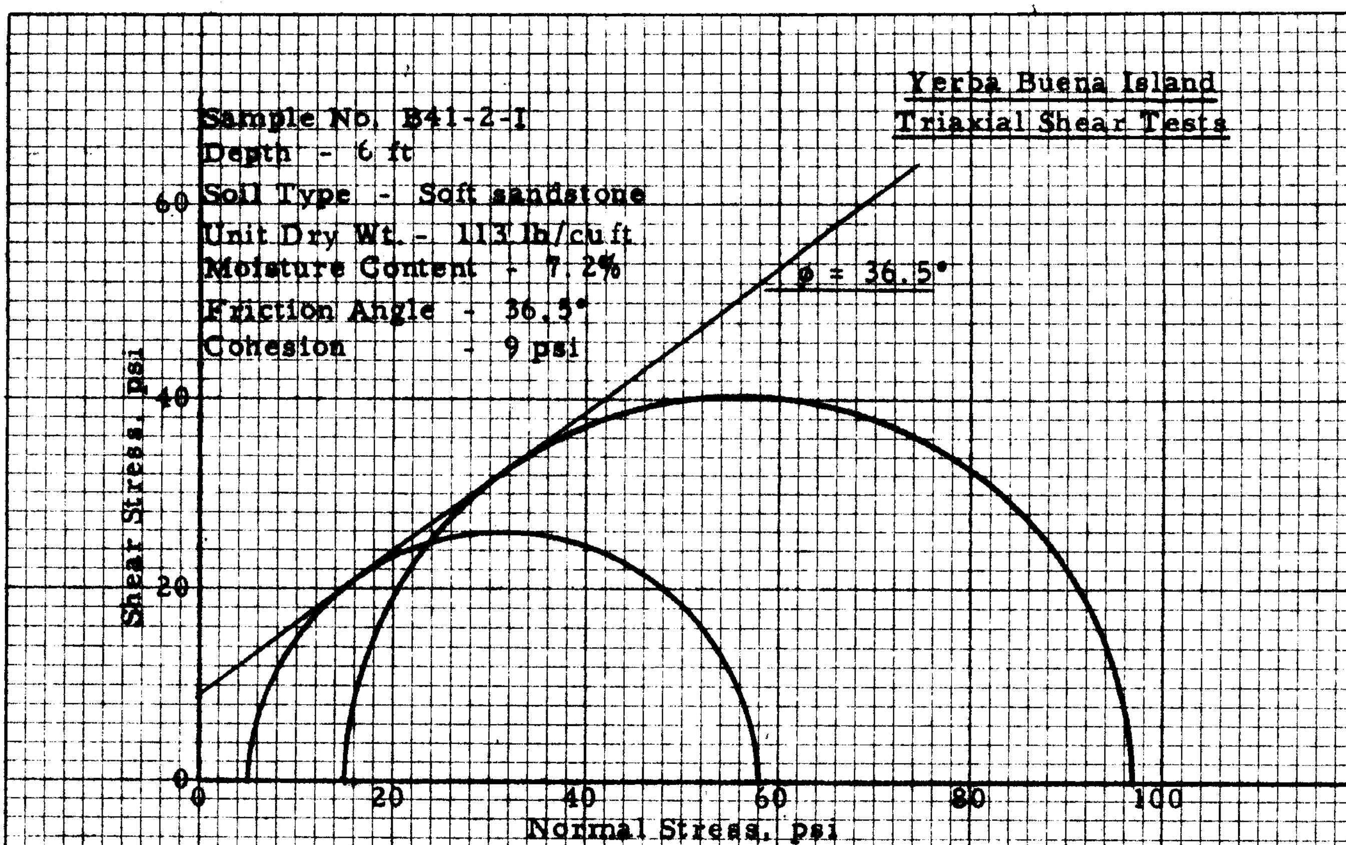
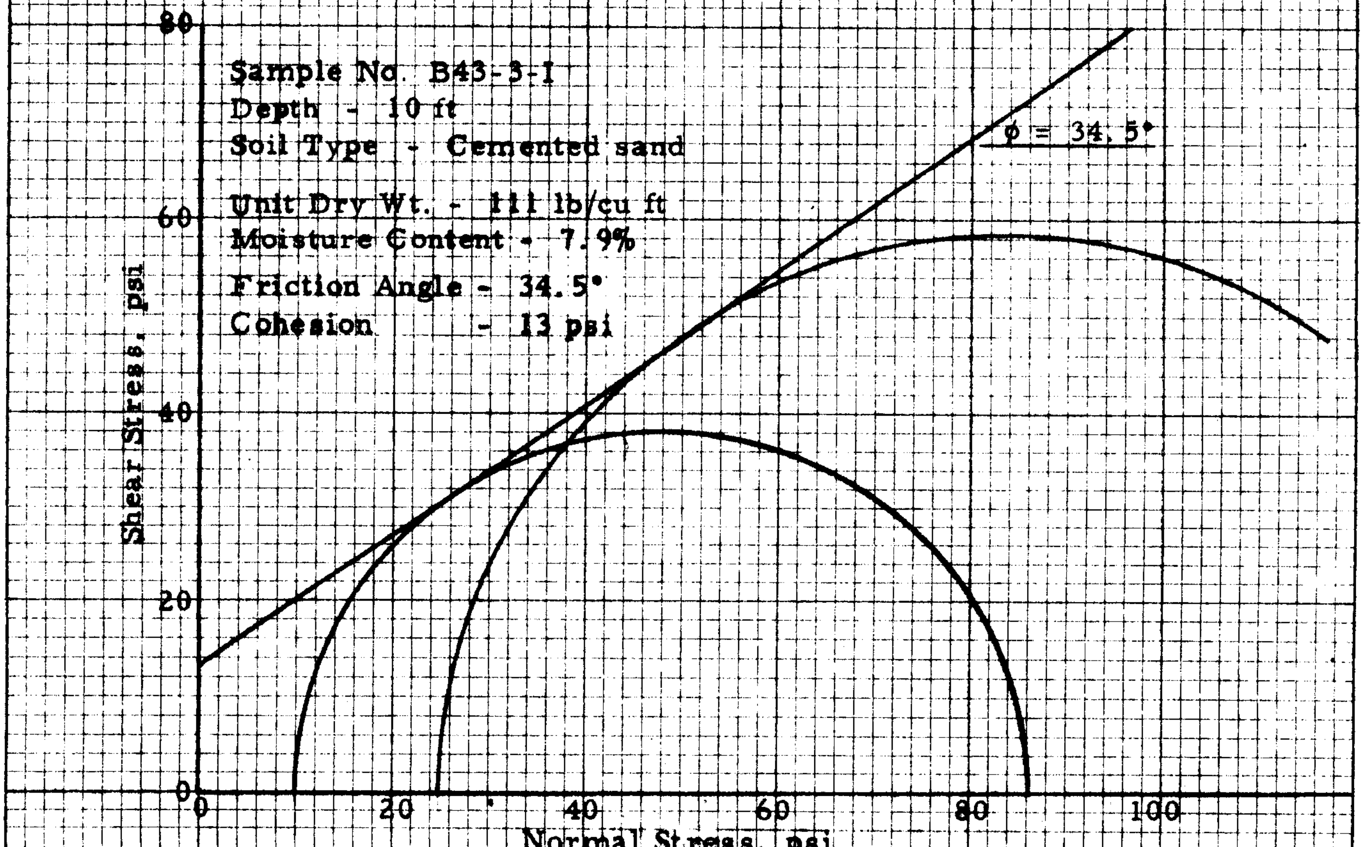
Date 1/11/65 Project No. 2498

PLATE No. 27





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Date 1/11/65	Project No. 2498

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SAN FRANCISCO

DATE: 1/11/65

Yerba Buena Island
Miscellaneous Test Data

PROJECT No: 2498

Unit Weight and Moisture Content

Boring No.	B 41	B 44	B 44	B 46	B 48
Sample No.	2-II	1-I	2-II	1-I	2-I
Depth, ft	6-1/2	3	8	11	7
Unit Dry Weight, lb/cu ft	121	102	100	100	103
Moisture Content, %	6.0	8.0	2.9	3.7.	3.0
Sample Description	Soft sandstone.	Sand, med.-dense.	Sand, med.-dense.	Sand, med.-dense.	Fine sand, dense.

Sieve Analyses

Boring No.	B 44	B 44	B 48
Sample No.	1-I	2-II	2-I
Depth, ft	3	8	7
Sieve Size	**% Passing**		
U.S. No. 16	100		
U.S. No. 30	99	100	
U.S. No. 50	86	63	100
U.S. No. 100	21	15	38
U.S. No. 200	8	4	11
Sample Description	Sand.	Sand.	Fine sand.

Slaking Test

Boring No.	B 41	B 41	B 43	B 43
Sample No.	2-III	3-I	3-II	4-II
Depth, ft	7	11	11	10
Slake rate	Slow	Very slow	Fast	Slow
Soil Description	Soft sandstone.	Soft sandstone.	Sand, slightly cemented.	Soft sandstone.

DATE: 1/11/65

Boring Logs, Yerba Buena Island
Supplementary Information

PROJECT No: 2498

1. Drilling equipment - Williams auger, 12-inch diam.

2. Sampling equipment

   California type. Driver - 140 lb, 30-inch drop.

3. Sample designation

   B 44 - 2 - II

   B 44 = Boring number
   2 = Drive number
   II = Second sample above sampler tip.